**REMARKS**

Claims 1-25 are pending in this application. Claims 1-3, 6 and 8 were rejected under 35 U.S.C. § 102(e) as allegedly anticipated by U.S. Patent No. 6,596,641 B1 ("Jost"). Claims 7, 9 and 10 were rejected under 35 U.S.C. §103(a) as allegedly obvious over Jost in view of U.S. Patent No. 6,100,202 ("Lin"). These rejections are respectfully traversed, for reasons including those set forth below. Applicants' attorney greatly appreciates the indications that claims 11-25 are allowable and that claims 4 and 5 would be allowable if rewritten.

**Responses to Claim Rejections**

It is respectfully submitted that Jost fails to teach several steps of independent method claim 1. The first step of claim one is "introducing a dopant precursor gas having a dopant precursor gas flow rate and a silicon-containing gas having a silicon-containing gas flow rate into a plasma." However, Jost teaches away from performing its methods in a plasma environment:

> In the illustrated and preferred embodiment, chamber 60 is preferably a subatmospheric chemical vapor deposition reactor, and **preferably not a plasma enhanced chemical vapor deposition reactor.**

(Id. at col. 4, lines 29-32.)

Moreover, the methods taught by Jost, as understood, are much different from the remaining steps of the method recited in claim 1:

, wherein a ratio of the dopant precursor gas flow rate to the silicon-containing gas flow rate has an initial value;

increasing the ratio from the initial value to a final value during an initial period; and

maintaining the ratio at the final value during a final period,

wherein during the initial period and the final period the dopant precursor gas and the silicon-containing precursor gas react in the plasma to form the doped silicon dioxide layer on the wafer.

Even if one overlooks the reference to "react[ing] in the plasma," Jost does not teach increasing a ratio of a dopant precursor gas flow rate to a silicon-containing gas flow rate during an initial deposition period. On the contrary, Jost teaches that a mixture of dopant precursor and silicon-containing gas should not be introduced to the wafer until the ratio has reached a steady-state condition, after which the ratio remains constant during the times of deposition:

> In a specific and preferred embodiment, the liquid precursor flowing in stream 64 to vaporizer V1 is vaporized to form a flowing vaporized precursor within stream 67 and stream 70. Valve 76 is preferably initially totally closed to line 72 and is preferably initially totally opened to line 74. Thereby, the flowing vaporized precursor in stream 70 is initially bypassed from entering chamber 60 and allowed to flow out exhaust stream 84 for some first period of time while substrate 10 is within deposition chamber 60. A preferred reason for initially bypassing flow of the precursor to chamber 60 is that the flow of the flowing precursor from the vaporizer is typically not initially at a desired steady state. Preferably, the period of time is selected to be effective to achieve steady state flow of the vaporized precursor at the conclusion of the period.

(Jost at col. 5, lines 1-14 [referring to Fig. 7].)

Here, stream 67 is a silicon-containing gas (TEOS), stream 68 is a phosphorous precursor and stream 69 is a boron precursor. (See col. 4, lines 55-64.) Therefore, stream 70 is a combination of dopant precursors and silicon-containing gas. Stream 80 is a mixture of $O_2$ and $O_3$. (See col. 4, lines 64-67.) Accordingly, when valve 76 is initially closed to line 72 and is initially opened to line 74, the combination of dopant precursors and silicon-containing gas does not enter the deposition chamber.

As understood, each combination of dopant precursors and silicon-containing gas discussed in Jost is allowed to enter the deposition chamber only after a steady-state ratio has been achieved:

> In conjunction with the above flowing first vaporized precursor, the second liquid deposition precursor flowing in line 65 is preferably caused to be vaporized by vaporizer V2 to form a flowing second vaporized precursor, in this example comprising the phosphorous dopant, within line 68 and thereby also within combined flowpath 70 with the flowing first vaporized precursor from line 67. The flowing first and second vaporized precursors are thereby initially bypassed

> within combined flowpath 70 from entering chamber 60 for a period of time while substrate 10 is within deposition chamber 60. The preferred desire and effect is to achieve steady state flow at the desired deposition conditions of the first and second precursors within line 70 prior to flowing the same to deposition chamber 60. The period of time to achieve stabilization is typically less than 10 seconds. Preferably after achieving a steady state flow, the first and second vaporized precursors are directed within combined flowpath 70 to flow into chamber 60 with the substrate therein under conditions effective to chemical vapor deposit first dielectric layer 22 (FIG. 3) comprising the first dopant, in this example phosphorous, over substrate 10. Such can be accomplished by reversing the opened/closed relationship of lines 72/74 with valve 76.

(Id. at col. 5, lines 18-40.)

As understood, Jost teaches that the ratio of the dopant precursor gas flow rate to the silicon-containing gas flow rate should be changed only between deposition cycles:

> Preferably essentially simultaneously with the conclusion of layer 22 formation, the flowing first and second vaporized precursors within combined flowpath 70 are bypassed from entering chamber 60 while substrate 10 is therewithin. Such preferably occurs by switching valve 76 completely closed to line 72 and completely opened to line 74, all while continuing operation of vaporizers V1 and V2. Preferably essentially simultaneously therewith, a third deposition precursor, in this example in the form of triethylborate, flowing in line 66 is vaporized in vaporizer V3 forming a flowing third vaporized precursor comprising a second dopant (here, boron), different from the first dopant, in line 69. The flowing third vaporized precursor in line 69 is combined with the flowing bypassed first and second vaporized precursors in combined flowpath 70, with the combined flowing first, second and third vaporized precursors therewithin being bypassed to exhaust 84 and thereby prevented from entering chamber 60 for a period of time while substrate 10 is within chamber 60. As with the above-described processing, such period of time is preferably suitable to achieve steady state flow of the combined precursors, and will typically be less than 10 seconds.

(Id. at col. 6, lines 24-45.)

However, claim 1 recites "increasing the ratio [of the dopant precursor gas flow rate to the silicon-containing gas flow rate] from the initial value to a final value during an initial period." Claim 1 also states that deposition occurs during this initial period.

It is respectfully submitted that the foregoing arguments overcome the rejections stated in the Office Action and that claim 1 is allowable. Accordingly, claims 2-10 are allowable as dependent from claim 1.

## Conclusion

Claims 1-25 define novel and non-obvious subject matter of the present invention. Accordingly, an early notification that the application is in condition for allowance is earnestly solicited.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP

Roger S. Sampson

Roger S. Sampson
Reg. No. 44,314

P.O. Box 778
Berkeley, CA 94704-0778